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LIST OF CNIDARIAN MEDUSAE DEPOSITED IN THE SAITO HO-ON KAI MUSEUM OF NATURAL HISTORY, WITH SPECIAL REFERENCE TO THE PRESENCE OF "LARGE"-FORM IMMORTAL MEDUSAE *TURRITOPSIS NUTRICULA*

Shin KUBOTA* and Yutaka YAMAZAKI**

Abstract

Fifteen medusan species of 15 genera belonging to 14 families of eight orders of two classes in the phylum Cnidaria were identified among several hundred specimens collected from seas surrounding the Tohoku District in northern Honshu, Japan, that have been deposited for ca 75 years in the Saito Ho-on Kai Museum of Natural History. Part of the collection comprises specimens purchased commercially for education and exhibition and those transferred from the natural history collections of the Sendai Junior School of Military Service after World War II. Special notice is given to the second-oldest known lot of *Turritopsis nutricula* with tentacles arranged in more than two whorls; the only older such Japanese specimens were collected from Misaki and described by Maas in 1909, and all other records are recent. As is generally true for the "large" form of *T. nutricula*, to which the present sample is assigned, all females were brooding many planula larvae on the manubrium.

Keywords: medusae, Tohoku District, Saito Ho-on Kai Museum of Natural History, external morphology, brooding mode, immortal medusa, *Turritopsis nutricula*.

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Introduction

Medusan specimens collected from seas surrounding the Tohoku District in northern Honshu, the largest island of the Japanese Archipelago, have been deposited for ca 75 years in the Saito Ho-on Kai Museum of Natural History, but no taxonomic report concerning them has so far been published. Other specimens of medusae in the collection include those purchased commercially for education and exhibition and those transferred from the natural history collections of the Sendai Junior School of Military Service after World War II. These latter specimens include the old medusan specimens in the Saito Ho-on Kai Museum of Natural History and are abbreviated as Co/MS in the text. Collections of medusae from the Tohoku District were made in the 1930s mainly by many local biologists and naturalists including school teachers, among them were Haruhiko Tsunoda (henceforth abbreviated as HT), Ichiro Imai (II), Kunio Ito (KI), Jyouhei Kamiya (JK), Shin-ichiro Koyama (SKo), Saburo Kumagai (SKu), Shichihei Nomura (SN), Shinryu Ofuchi (SO), Eishiro Sawano (ES), Seisuke Tadano (ST), and Makoto Toriumi (MT).

Although some specimens had dried out and could not be identified, many lots have been preserved in good condition. Among them, the immortal medusa *Turritopsis nutricula* McCrady could be determined to form by its external morphology and mode of sexual reproduction, using recently established criteria (Kubota, 2005; Kubota *et al*., 2005).

Altogether several hundred medusae were examined, all belonging to species that are easily noticed by naked eye in the field. The number of species in the collection is small, 15 species of 15 genera belonging to 14 families of eight orders of two classes in the phylum Cnidaria, with neither Cubozoa nor Ctenophora being represented. For six species only one specimen was deposited in the museum. In the following text the species previously reported from the Tohoku District are marked as follows: those from Onagawa Bay and its vicinity by Uchida (1938a: *), and those from Mutsu Bay by Uchida (1938b: #) and Kakinuma (1961: §). For each species, important taxonomic references (only the first page shown), registration numbers of the specimens, collection data (localities, dates, collectors in abbreviated form), and Japanese name are shown. For specimens without registration numbers, bottle numbers are shown in brackets. If neither number is available, a serial number is shown (in < >). Italicized registration numbers show which specimens were used for photographs (Plates I-III). A detailed study was made of only one species, *Turritopsis nutricula*, the systematic study of which has been advancing recently. The taxonomy of the other species is well established and requires no special elaboration.

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Phylum Cnidaria　刺胞動物門

Class Hydrozoa　ヒドロ虫綱

Order Anthomedusae　花クラゲ目

Family Clavidae　クラバ科

1. *# *Turritopsis nutricula* McCrady, 1857　Beni-kurage ベニクラゲ
(Plate I, figures 1-5 ; Plate II, figures 1, 2)

Kubota *et al*., 2005, p. 39, figs 1-3 ; Kubota, 2005, p. 41 ; Bouillon *et al*., 2004, p. 54, fig. 32A-C, E ; Kubota, 1997, p. 490, p. 532 : fig. 2-19 ; Kubota, 1992, p. 32, figs 4-7Ba, 4-7Bb ; Kramp, 1968, p. 27, fig. 66 ; Kramp, 1961, p. 66.

16230 : between Katsura-jima I. and Mahanashi-jima I., Miyagi Pref., 6 July 1931, SO ; [*200*] : Matsushima Bay, Miyagi Pref., 17 Nov. 1935, SO.

Determination of the form, and the mode of sexual reproduction : 11 males and 6 females were in registered bottle no. 200, and 3 males and 1 female in bottle no. 16230. All were mature or well-developed, up to 10 mm in diameter, and all females were brooding many planula larvae on the manubrium (Pl. I, Figs. 1-3). The tentacles are arranged in three whorls, up to 266 in total number (Pl. I, Figs. 4-5). All the specimens are assignable to the "large" form of the present species by these character states (Kubota, 2005 ; Kubota *et al*., 2005). They represent the second record of old specimens of this species with the tentacles arranged in more than two whorls, along with the earliest known Japanese specimens, collected from Misaki and described by Maas (1909).

Family Polyorchidae　キタカミクラゲ科

2. *# *Spirocodon saltator* (Tilesius, 1818)　Kami-kurage　カミクラゲ
(Plate II, figure 3)

Kubota, 1997, p. 493, p. 533 : fig. 3-28 ; Kubota, 1992, p. 37, pl. 5-10, b ; Kramp, 1968, p. 60, fig. 158 ; Kramp, 1961, p. 127.

16729 : Kesen-numa Bay, Miyagi Pref., Feb. 1932, ST ; 16621 : Dejima I., Miyagi Pref., 6 May 1932, SO ; *1082* : Asamushi, Aomori Pref., 2 June 1932, ES ; 16592 : Onagawa Bay, Miyagi Pref., 4 Oct. 1932, SO ; 17994 : Onagawa Bay, Miyagi Pref., 9 Mar. 1933, SO & KI.

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Explanation of Plate I

Figs. 1-5 : Scale bars=1 mm.

Figs. 1-5. ***Turritopsis nutricula*** McCrady Beni-kurage ベニクラゲ
1, 2 : side and oral views of two female specimens. 3 : magnified view of Fig. 2, showing brooded planula larvae. 4, 5 : oral view of male medusa and detail of tentacular bulbs.

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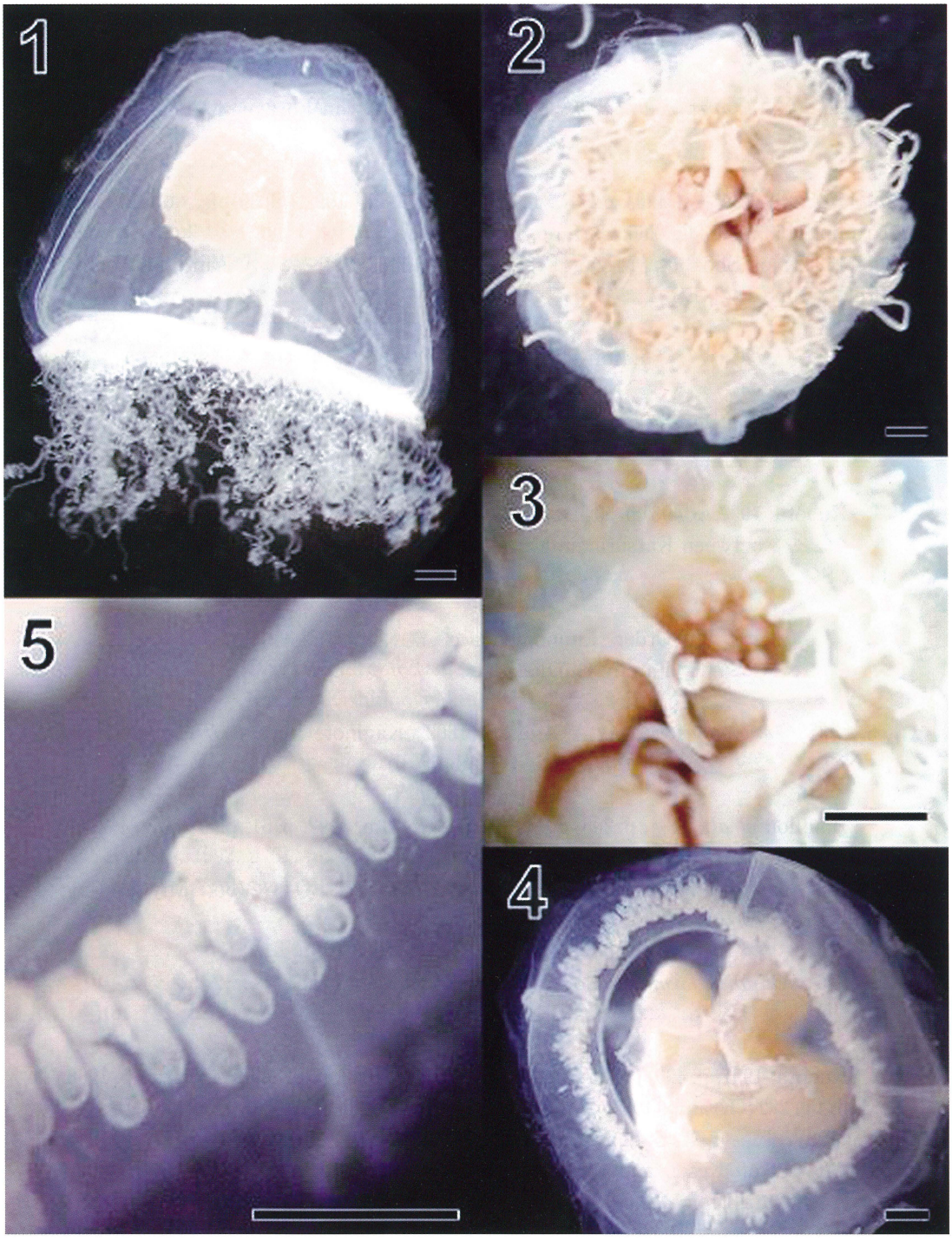

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Order Leptomedusae 軟クラゲ目
Family Aequoreidae オワンクラゲ科

3. *# *Aequorea coerulescens* (Brandt, 1838) Owan-kurage オワンクラゲ
(Plate II, figure 4)

Kubota, 1997, p. 490, p. 534 : fig. 4-34 ; Kubota, 1992, p. 39, figs 4-14a, 14b ; Kramp, 1968, p. 98, fig. 266 ; Kramp, 1961, p. 205.

15282 : off Shoubuta, Miyagi Pref., 28 June 1931, SN ; *1084* : Asamushi, Aomori Pref., 2 June 1932, ES.

Family Eirenidae マツバクラゲ科

4. * *Tima formosa* L. Agassiz, 1862 Giyaman-kurage ギヤマンクラゲ
(Plate II, figure 5)

Kubota, 1997, p. 496, p. 534 : fig. 4-40 ; Kramp, 1961, p. 202.

16229 : between Katsura-jima I. and Mahanashi-jima I., Miyagi Pref., 6 Dec. 1931, SO.

Order Limnomedusae 淡水クラゲ目
Family Olindiasidae ハナガサクラゲ科

5. *#§ *Gonionemus vertens* A. Agassiz, 1862 Kaginote-kurage カギノテクラゲ
(Plate II, figure 6)

Bouillon *et al*., 2004, p. 205, fig. 119A, B ; Kubota, 1992, p. 51, pl. 9-6, fig. 4-21B ; Kramp, 1968, p. 106, fig. 287 ; Kramp, 1961, p. 223.

56 : Asamushi, Mutsu Bay, Aomori Pref., June 1924, SO ; *12156* : Miyako Bay, Iwate Pref., 29 July 1937, SKo.

6. *Olindias formosa* (Goto, 1903) Hanagasa-kurage ハナガサクラゲ
(Plate II, figure 7)

Kubota, 1997, p. 499, p. 535 : fig. 5-52 ; Kubota, 1992, p. 51, pl. 9-4 ; Kramp, 1968, p. 105, fig. 282 ; Kramp, 1961, p. 229.

[193] : June 1917, Sagami Bay ; 25913 : Onahama, Fukushima Pref., Aug. 1931, HT ; 16781 : off Kesen-numa, Miyagi Pref., 21 May 1932, SO ; *20273* : Kamo harbor, Yamagata Pref., 4 Aug. 1935, II ; <1579> : Sagami Bay, July 1936, Co/MS.

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Order Chondrophora　盤クラゲ目
Family Porpitidae　ギンカクラゲ科

7. *Porpita porpita* (Linnaeus, 1758)　Ginka-kurage ギンカクラゲ
(Plate II, figure 8)

Bouillon *et al*., 2004, p. 111, fig. 339H, I ; Pagès *et al*., 1992, p. 23, fig. 22 ; Kubota, 1992, p. 58, pl. 10-4, fig. 4-28B.
＜1566＞: Wakayama Pref., May 1937, Co/MS, 1 specimen.

Order Siphonophora　管クラゲ目
Family Physaliidae　カツオノエボシ科

8. *Physalia physalis* (Linnaeus, 1758)　Katsuono-eboshi カツオノエボシ
(Plate II, figure 9)

Bouillon *et al*., 2004, p. 205, fig. 119A, B ; Pagès and Gili, 1992, p. 68, fig. 1 ; Kubota, 1992, p. 57, pl. 10-2.
[*213*]: Sagami Bay, July 1918, Co/MS, 1 specimen.

Class Scyphozoa　鉢虫綱
Order Stauromedusae　十文字クラゲ目
Family Kishinouyeidae　ジュウモンジクラゲ科

9. *# *Sasakiella cruciformis* Okubo, 1917　Sasaki-kurage ササキクラゲ
(Plate III, figure 1)

Kubota, 1992, p. 61, pl. 10-8 ; Hirano, 1986, p. 193, fig. 9 ; Kramp, 1961, p. 298.
19494: Ayukawa, Miyagi Pref., 2 Aug. 1936, MT, 1 specimen.

Family Haliclystidae　アサガオクラゲ科

10. *#§ *Haliclystus tenuis* Kishinouye, 1910　Asagao-kurage アサガオクラゲ
(Plate III, figure 2)

Hirano, 1997, p. 247, fig. 1 ; Hirano, 1986, p. 183, fig. 1 ; Kramp, 1961, p. 293.
19493: Ayukawa, Miyagi Pref., 2 Aug. 1936, MT, 1 specimen.

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Explanation of Plate II

Figs. 1, 2, 6 : Scale bars＝5 mm.
Figs. 3-5, 7-9 : Scale bars＝10 mm.

Figs. 1, 2. ***Turritopsis nutricula*** McCrady　Beni-kurage ベニクラゲ (1 : side view of male ; 2 : oral view of female)
Fig. 3. ***Spirocodon saltator*** (Tilesius)　Kami-kurage カミクラゲ (side view)
Fig. 4. ***Aequorea coerulescens*** (Brandt)　Owan-kurage オワンクラゲ (oral view)
Fig. 5. ***Tima formosa*** L. Agassiz　Giyaman-kurage ギヤマンクラゲ (oral view)
Fig. 6. ***Gonionemus vertens*** A. Agassiz　Kaginote-kurage カギノテクラゲ (abor-al view)
Fig. 7. ***Olindias formosa*** (Goto)　Hanagasa-kurage ハナガサクラゲ (oral view)
Fig. 8. ***Porpita porpita*** (Linnaeus, 1758)　Ginka-kurage ギンカクラゲ (oral view)
Fig. 9. ***Physalia physalis*** (Linnaeus)　Katsuono-eboshi カツオノエボシ (side view)

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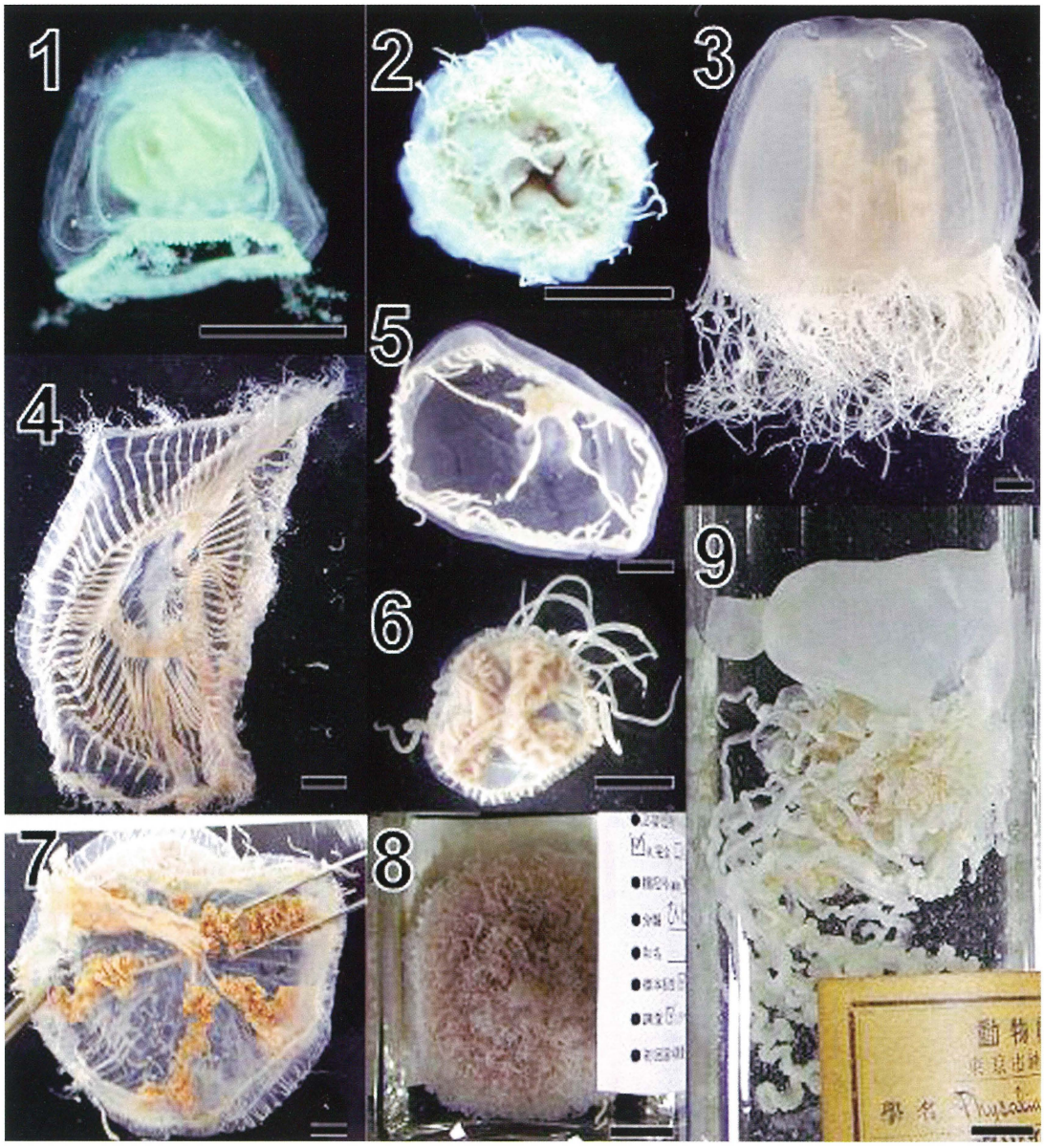

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Explanation of Plate III

Figs. 1, 2 : Scale bars＝1 mm.
Figs. 3-5 : Scale bars＝10 mm.

Fig. 1. ***Sasakiella cruciformis*** Okubo　Sasaki-kurage ササキクラゲ (oral view)
Fig. 2. ***Haliclystus tenuis*** Kishinouye　Asagao-kurage アサガオクラゲ (oral view)
Fig. 3. ***Cyanea capillata*** (Linnaeus)　Kitayuurei-kurage キタユウレイクラゲ (oral view)
Fig. 4. ***Mastigias papua*** (Lesson)　Tako-kurage タコクラゲ (oral view)
Fig. 5. ***Rhopilema esculenta*** Kishinouye　Bizen-kurage ビゼンクラゲ (oral view)

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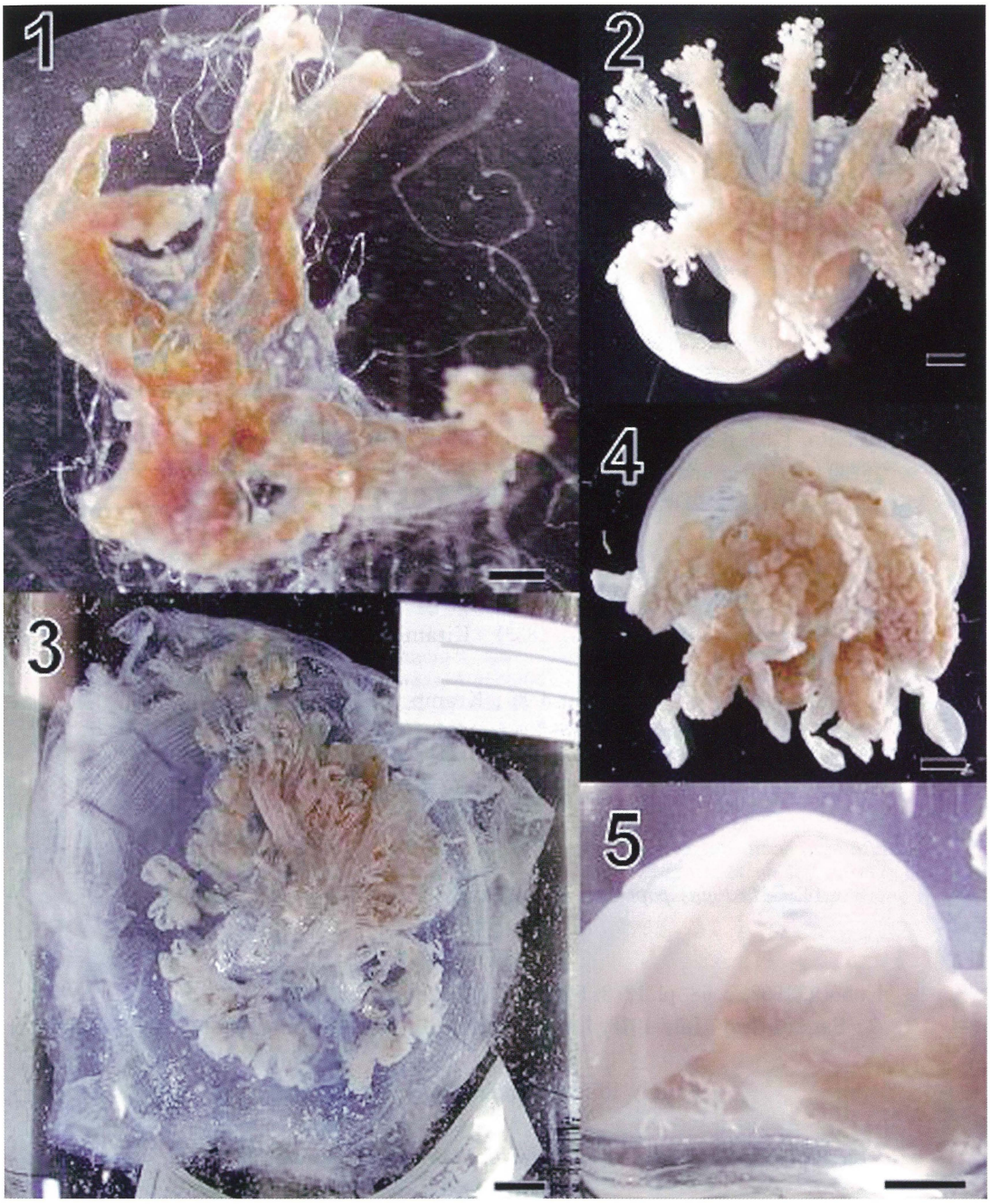

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Order Semaeostomae　旗口クラゲ目
Family Pelagiidae　オキクラゲ科

11. *#§ *Chrysaora melanaster* Brandt, 1838　Aka-kurage アカクラゲ

Kubota, 1992, p. 64, pl. 11-6 ; Kramp, 1961, p. 326.
1083 : Mutsu Bay, Aomori Pref., 2 May 1932, ES.

Family Cyaneidae　ユウレイクラゲ科

12. # *Cyanea capillata* (Linnaeus, 1758)　Kitayuurei-kurage キタユウレイクラゲ
(Plate III, figure 3)

Kubota, 1992, p. 64, pl. 11-8 ; Kramp, 1961, p. 332.
16730 : Kesen-numa Bay, Miyagi Pref., Feb. 1932, ST ; *16591* : Onagawa Bay, Miyagi Pref., 4 May 1932, SO.

Family Ulmariidae　ミズクラゲ科

13. *Aurelia limbata* (Brandt, 1838)　Kitamizu-kurage キタミズクラゲ

Kubota, 1992, p. 65, pl. 12-5, fig. 4-35 ; Kramp, 1961, p. 341.
16782 : off Kesen-numa, Miyagi Pref., May 1932, 1 specimen.

Order Rhizostomae　根口クラゲ目
Family Mastigiadidae　タコクラゲ科

14. *Mastigias papua* (Lesson, 1830)　Tako-kurage タコクラゲ
(Plate III, figure 4)

Kubota, 1992, p. 68, pl. 12-8, fig. 4-36B ; Kramp, 1961, p. 359.
8 : Sagami Bay, July 1918, 1 specimen.

Family Rhizostomidae　ビゼンクラゲ科

15. *Rhopilema esculenta* Kishinouye, 1891　Bizen-kurage ビゼンクラゲ
(Plate III, figure 5)

Kubota, 1992, p. 68, pl. 12-9, fig. 4-36D ; Kramp, 1961, p. 380.
9 : Okayama Pref., July 1918, 1 specimen.

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